



EMC Technologies Pty Ltd
ABN 82 057 105 549
57 Assembly Drive
Tullamarine Victoria Australia 3043

Ph: + 613 9335 3333
Fax: + 613 9338 9260
email: melb@emctech.com.au

**EMI TEST REPORT
for
CERTIFICATION to
FCC PART 15.231 & RSS-210**

**FCC ID: SFA-01012005
Industry Canada ID: 5287A-01012005**

Test Sample: RF Remote Handset Transmitter
Model: 910-388
Tested for: Fireplace Products International Ltd

Report Number: M040713_Cert_Tx

Issue Date: 19th August 2004

EMC Technologies Pty Ltd reports apply only to the specific samples tested under stated test conditions. It is the manufacturer's responsibility to assure that additional production units of this model are manufactured with identical electrical and mechanical components. EMC Technologies Pty Ltd shall have no liability for any deductions, inferences or generalisations drawn by the client or others from EMC Technologies Pty Ltd issued reports. This report shall not be used to claim, constitute or imply product endorsement by EMC Technologies Pty Ltd.



The tests, calibrations or measurements covered by this document have been performed in accordance with NATA requirements which include the requirements of ISO/IEC 17025 and are traceable to national standards of measurement. This document shall not be reproduced, except in full.

**NATA Accredited Laboratory
Number: 5292**

**EMI TEST REPORT FOR CERTIFICATION
to
FCC Part 15.231 & RSS-210**

EMC Technologies Report No. M040713_Cert_Tx

Issue Date: 19th August 2004

CONTENTS

- 1.0 INTRODUCTION**
- 2.0 GENERAL INFORMATION**
- 3.0 CONDUCTED EMI MEASUREMENTS**
- 4.0 RADIATED EMI MEASUREMENTS**
- 5.0 BANDWIDTH**
- 6.0 ANTENNA REQUIREMENT**
- 7.0 COMPLIANCE STATEMENT**

APPENDIX A: MEASUREMENT INSTRUMENT DETAILS

APPENDIX B: TEST SAMPLE PHOTOGRAPHS

APPENDIX C: OPERATIONAL DESCRIPTIONS

APPENDIX D: TEST SAMPLE BLOCK DIAGRAM

APPENDIX E: TEST SAMPLE SCHEMATIC

APPENDIX F: TEST SAMPLE PCB LAYOUT

APPENDIX G: FCC ID LABELLING

APPENDIX H: GRAPHS of EMI MEASUREMENTS

APPENDIX I: CHANNEL BANDWIDTH PLOTS

APPENDIX J: PULSEWIDTH & DUTY CYCLE

APPENDIX K: USER MANUAL



This Laboratory is accredited by the National Association of Testing Authorities, Australia. The tests reported herein have been performed in accordance with its terms of accreditation for FCC Part 15. This document shall not be reproduced, except in full.

EMI TEST REPORT FOR CERTIFICATION
to
FCC PART 15.231 & RSS-210

Report Number: **M040713_Cert_Tx**

Test Sample: RF Remote Handset Transmitter
Model: 910-388
Manufacturer: Millennium Electronics Pty Ltd
Address: 12 Webber Parade, East Keilor, VIC 3033, Australia
Phone: +61 3 9331 7032
Fax: +61 3 9331 7038
Contact: Eric Au

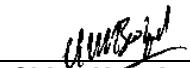
FCC ID: SFA-01012005
Industry Canada ID: 5287A-01012005
Equipment Type: Intentional Radiator

Tested for: Fireplace Products International Ltd
Address: 6988 Venture Street, Delta BC, Canada, V4G1H4
Phone: +604 9465155
Fax: +604 9464349
Responsible Party: Peter Yuen

Test Standards: FCC Part 15, Subpart C – Intentional Radiators
 FCC Part 15.231: Periodic operation in the band 40.66-40.70 MHz
 and above 70 MHz
 ANSI C63.4 – 2003
 OET Bulletin No. 65

RSS-210 Issue 5 Low Power Licence-Exempt RadioCommunication
 Devices: 6.1.1: Momentarily Operated Devices

Test Dates: 12th to 22nd July 2004

Test Officers: 
 Chieu Huynh B.Eng (Hons) Electronics
 Jorge Lara

Attestation: *I hereby certify that the device(s) described herein were tested as described in this report and that the data included is that which was obtained during such testing.*

Authorised Signatory: 
 Chris Zombolas
 Technical Director
 EMC Technologies Pty Ltd



EMI TEST REPORT FOR CERTIFICATION
to
FCC PART 15.231 & RSS-210

1.0 INTRODUCTION

This report details the results of EMI tests and measurements performed on the RF Remote Handset Transmitter, Model: 910-388.

Test results and procedures were performed in accordance with the following Federal Communications Commission (FCC) standards/regulations:

47 CFR, Part 15, Subpart C:	Rules for intentional radiators (particularly section 15.231)
Section 15.203:	Antenna requirements
Section 15.205:	Restricted bands of operation
Section 15.207:	Conducted Emission Limits
Section 15.209:	Radiated Emission Limits (General requirements)
Section 15.231:	Periodic operation in the band 40.66-40.70 MHz and above 70 MHz

The test sample **complied** with the requirements of 47 CFR, Part 15 Subpart C - Section 15.231.

The test sample also complied with the Industry Canada RSS-210 issue 5 (Low Power Licence-Exempt Radiocommunication Devices (All Frequency Bands)) clause 6.1.1

The RF Remote Handset Transmitter (RF Remote) is Radio Frequency based Thermostat that is designed to communicate with the Millivolt System which in turn operates a fireplace unit. The results for the Millivolt System are reported separately. Refer to EMC Technologies' test report: M040714_DoC_Rx (Declaration of Conformity).

1.1 Summary of Results

FCC Part 15, Subpart C Clauses	Industry Canada RSS-210 Clauses	Test Performed	Result
15.203	5.5	Antenna Requirement	Not Applicable
15.205	6.3	Operation in Restricted Band	Complies
15.207	6.6	Conducted Emissions	Not Applicable
15.209	6.3	Radiated Emissions	Complies
15.231 (b)	6.1.1(b)	Field Strength Emissions	Complies
15.231 (c)	6.1.1(c)	20 dB Bandwidth	Complies

The measurement procedure used was in accordance with ANSI C63.4-2003 and OET Bulletin No. 65. The instrumentation conformed to the requirements of ANSI C63.2-1996.

1.2 Modifications by EMC Technologies

No modifications were required.



This Laboratory is accredited by the National Association of Testing Authorities, Australia. The tests reported herein have been performed in accordance with its terms of accreditation for FCC Part 15. This document shall not be reproduced, except in full.

2.0 GENERAL INFORMATION

(Information supplied by the Client)

2.1 Product Details

Test Sample: RF Remote Handset Transmitter
Model: 910-388
FCC ID: SFA-01012005
Industry Canada ID: 5287A-01012005
Equipment Type: Low Power Transmitter (Intentional Radiator)

2.2 Test Sample Operational Description

The RF Remote Handset Transmitter (RF Remote) is Radio Frequency based Thermostat that is designed to communicate with the Millivolt System which in turn operates a fireplace unit.

Refer to Appendix C for further details.

2.3 Test sample configuration

The RF Remote Handset Transmitter was transmitting continuously during the tests.

Testing was performed with new batteries fitted and rotated around 3 orthogonal planes. The worst-case results are reported.

Refer to Appendix B - Test Setup Photographs.

2.4 Test Sample Block Diagram

Refer to Appendix D – Test Sample Block Diagram

2.5 Test Procedure

Emissions measurements were performed in accordance with the procedures of ANSI C63.4-2003. Radiated emissions tests were performed at a distance of 3 and 10 metres from the EUT. OET Bulletin 65 dated June 2001 was used for reference.

2.6 Test Facility

2.6.1 General

Radiated Emission measurements were performed at EMC Technologies open area test site (OATS) situated at Lerderderg Gorge, near the township of Bacchus Marsh in Victoria, Australia. Bandwidth measurements were performed at EMC Technologies' laboratory in Tullamarine, (Melbourne) Victoria Australia.

The above sites have been fully described in a report submitted to the FCC office, and accepted in a letter dated June 14, 2002, **FCC Registration Number 90560**.



This Laboratory is accredited by the National Association of Testing Authorities, Australia. The tests reported herein have been performed in accordance with its terms of accreditation for FCC Part 15. This document shall not be reproduced, except in full.

2.6.2 NATA Accreditation

EMC Technologies is accredited in Australia to test to the following standards by the National Association of Testing Authorities (NATA).

"FCC Part 15 unintentional and intentional emitters in the frequency range 9kHz to 18 GHz excluding TV receivers (15.117 and 15.119), TV interface devices (15.115), cable ready consumer electronic equipment (15.118), cable locating equipment (15.213) and unlicensed national information infrastructure devices (Sub part E)."

The current full scope of accreditation can be found on the NATA website: www.nata.asn.au
It also includes a large number of emission, immunity, SAR, EMR and Safety standards.

NATA is the Australian national laboratory accreditation body and has accredited EMC Technologies to operate to the IEC/ISO17025 requirements. A major requirement for accreditation is the assessment of the company and its personnel as being technically competent in testing to the standards. This requires fully documented test procedures, continued calibration of all equipment to the National Standard at the National Measurements Laboratory (NML) and an internal quality system to ISO 9002. NATA has mutual recognition agreements with the National Voluntary Laboratory Accreditation Program (NVLAP) and the American Association for Laboratory Accreditation (A²LA).

2.7 Units of Measurements

Radiated Emissions

Measurements are reported in units of dB relative to one microvolt per metre (dB μ V/m).

2.8 Test Equipment Calibration

All measurement instrumentation and transducers were calibrated in accordance with the applicable standards by an independent NATA registered laboratory such as Agilent Technologies (Australia) Pty Ltd or the National Measurement Laboratory (NML). All equipment calibration is traceable to Australia national standards at the National Measurements Laboratory. The reference antenna calibration was performed by NML and the working antennas (biconical and log-periodic) calibrated by the NATA approved procedures. The complete list of test equipment used for the measurements, including calibration dates and traceability is contained in Appendix A.

2.9 Ambients at OATS

The Open Area Test Site (OATS) is an area of low background ambient signals. No significant broadband ambients are present however commercial radio and TV signals exceed the limit in the FM radio, VHF and UHF television bands. Radiated prescan measurements were performed in the shielded enclosure to check for possible radiated emissions at the frequencies where the OATS ambient signals exceeded the test limit.

3.0 CONDUCTED EMISSION MEASUREMENTS

Not applicable, as EUT is battery powered.



This Laboratory is accredited by the National Association of Testing Authorities, Australia. The tests reported herein have been performed in accordance with its terms of accreditation for FCC Part 15. This document shall not be reproduced, except in full.

4.0 RADIATED EMISSION MEASUREMENTS

4.1 Test Procedure

Testing was performed in accordance with the requirements of FCC Part 15.231.

Radiated emission measurements were performed to the limits as per section 15.209.

The EUT was set up on the table top (placed on turntable) of total height 80 cm above the ground plane, and operated as described in section 2 of this report. The EMI Receiver was operated under software control via the PC Controller through the IEEE.488 Interface Bus Card Adaptor. The test frequency range was sub-divided into smaller bands with sufficient frequency resolution to permit reliable display and identification of possible EMI peaks while also permitting fast frequency scan times. A calibrated Biconical antenna was used for measurements between 30 MHz to 232 MHz and a calibrated Logperiodic antenna used for measurements between 230 MHz to 1000 MHz. Calibrated EMCO 3115 Horn antenna was used for measurements between 1000 to 4340 MHz.

The measurement of emissions between 30 - 1000 MHz was measured with the resolution bandwidth of 120 kHz and the video bandwidth of 300 kHz.

The measurement of emissions above 1000 MHz, appearing in the restricted bands, was made using an average detector with a bandwidth of 1.0 MHz.

The EUT was slowly rotated with the Peak Detector set to Max-Hold. This was performed for two antenna heights. Each significant peak was then investigated and maximised with the Quasi-Peak detector. The measurement data for each frequency range was automatically corrected by the software for cable losses, antenna factors and preamplifier gain and all data was then stored on disk in sequential data files. This process was performed for both horizontal and vertical antenna polarisations.

4.2 Plotting of Measurement Data for Radiated Emissions

The stored measurement data was combined to form a single graph which comprised of all the frequency sub-ranges over the range 30-1000 MHz. The accumulated EMI (EUT ON) was plotted as the Red trace while the Ambient signals (AMBIENT) were plotted as Green trace. The worst case radiated EMI peak measurements as recorded using the Max-Hold data are presented as the upper or **RED** trace while the respective ambient signals are presented as the lower or **GREEN** trace. Occasionally, an intermittent ambient arose during the EUT ON measurement (RED trace) and could not be captured when the Ambient trace was being stored. The ambient peaks of significant amplitude with respect to the limit are tagged with the "#" symbol while EMI peaks are identified with a numeral. Ambient peaks that were present during the EUT ON measurement (RED trace) and not captured during the AMBIENT measurement were also tagged with the "#" symbol.

The highest recorded EMI signals are shown on the Peaks List on the bottom right side of the graph. For radiated EMI, each numbered peak is listed as a frequency, peak field strength, quasi-peak field strength and the margin relative to the limit in dB. A negative margin is the deviation of the recorded value below the limit.

At times, the quasi peak level may appear to be higher than the peak level. This happens because the individual peak is further maximised with the QP detector, after the peak trace is recorded. This will be apparent when the peaks list at the foot of the graphs shows the quasi peak level.



4.3 Calculation of Peak and Average Field Strength

The peak field strength was calculated automatically by the software using all the pre-stored calibration data. The method of calculation is shown below:

$$E = V + AF - G + L \text{ Where:}$$

E = Radiated Peak Field Strength in dB μ V/m.
V = EMI Receiver Voltage in dB μ V. (measured value)
AF = Antenna Factor in dB(m⁻¹). (stored as a data array)
G = Preamplifier Gain in dB. (stored as a data array)
L = Cable loss in dB. (stored as a data array of Insertion Loss versus frequency)

- **Example Peak Field Strength Calculation**

Assuming a receiver reading of 34.0 dB μ V is obtained at 90 MHz, the Antenna Factor at that frequency is 9.2 dB. The cable loss is 1.9 dB while the preamplifier gain is 20 dB. The resulting Field Strength is therefore as follows:

$$34.0 + 9.2 + 1.9 - 20 = 25.1 \text{ dB}\mu\text{V/m}$$

The average field strength level was calculated from the peak field strength measurement (uV/m) multiply with the duty cycle over 100 mS. The duty cycle was calculated by averaging the sum of the pulselwidths over one complete pulse train including blanking interval. Refer to Appendix J for pulselwidths duty cycle and blanking.



This Laboratory is accredited by the National Association of Testing Authorities, Australia. The tests reported herein have been performed in accordance with its terms of accreditation for FCC Part 15. This document shall not be reproduced, except in full.

4.4 Results - Fundamental and Spurious (30 to 4340 MHz)

Testing was carried out in accordance with the requirements of FCC Part 15.231(b), 15.205(a) and 15.209(a).

The transmitter is manually operated (powered via the push button switches located on the device), employing a switch that automatically deactivates transmission within not more than 5 seconds of being released as per FCC Part 15.231(a)(1).

The transmitter is also operated in auto mode. It is automatically ceases transmission within 5 seconds after activation as per FCC Part 15.231(a)(2).

The measurements were made at an open area test site at a distance of 10 metres for frequency range between 30 – 1000 MHz and 3 metres for frequency range between 1000 – 4340 MHz. The limits for frequency range between 30 – 1000 MHz were adjusted accordingly.

Pulsewidth (mS) Over 100mS	Pulsewidth Duty Cycle (%)	Duty Cycle (%)	Refer to Appendix
36.0	55 (worst case)	19.8	J

Frequency MHz	Polarisation	Peak Level Measured dB μ V/m	*Calculated Average Level dB μ V/m	Average Limit dB μ V/m	Δ Average \pm dB
433.83	Horizontal	84.1	70.0	70.3**	-0.3
433.83	Vertical	73.1	59.0	70.3**	-11.3
867.67	Horizontal	57.4	43.3	50.3**	-7.0
867.67	Vertical	56.0	41.9	50.3**	-8.4
1302.42	Vertical	55.3	41.2	54.0	-12.8
1302.20	Horizontal	48.9	34.8	54.0	-19.2

*Duty cycle = 19.8%, Refer to Appendix J for pulsewidths duty cycle

**The limits for frequency range between 30 – 1000 MHz were corrected for 10 metres distance.

Result : The highest radiated field strength emission complied with FCC average limit by a margin of 0.3 dB at 433.83 MHz. The measurement uncertainty for radiated field strength emissions was \pm 3.7 dB. Refer to Appendix H, graphs 1 to 2.

5.0 BANDWIDTH

Testing was performed in accordance with the requirements of FCC Part 15.231(c).

The bandwidth of the emission shall be no wider than 0.25% of the centre frequency.

The resolution bandwidth of 30 kHz and the video bandwidth of 30 kHz were utilised

Bandwidth kHz	Limit kHz	Result	20 dB Bandwidth Plots
185	< 1085	Complies	Appendix I

Conclusion: Complies.



This Laboratory is accredited by the National Association of Testing Authorities, Australia. The tests reported herein have been performed in accordance with its terms of accreditation for FCC Part 15. This document shall not be reproduced, except in full.

6.0 ANTENNA REQUIREMENT

Testing to the requirements of FCC Part 15.203 was not applicable as this intentional radiator was designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device.

7.0 COMPLIANCE STATEMENT

The RF Remote Handset Transmitter, Model: 910-388, tested on behalf of Fireplace Products International Ltd, **complies** with the requirements of 47 CFR, Part 15 Subpart C - Rules for Radio Frequency Devices (intentional radiators), Section 15.231 – Periodic operation in the band 40.66 – 40.70 MHz and above 70 MHz.

The test sample also complies with the Industry Canada RSS-210 issue 5 (Low Power Licence-Exempt Radiocommunication Devices (All Frequency Bands)) clause 6.1.1

Results were as follows:

FCC Part 15, Subpart C Clauses	Industry Canada RSS-210 Clauses	Test Performed	Result
15.203	5.5	Antenna Requirement	Not Applicable
15.205	6.3	Operation in Restricted Band	Complies
15.207	6.6	Conducted Emissions	Not Applicable
15.209	6.3	Radiated Emissions	Complies
15.231 (b)	6.1.1(b)	Field Strength Emissions	Complies
15.231 (c)	6.1.1(c)	20 dB Bandwidth	Complies



This Laboratory is accredited by the National Association of Testing Authorities, Australia. The tests reported herein have been performed in accordance with its terms of accreditation for FCC Part 15. This document shall not be reproduced, except in full.

TEST REPORT APPENDICES

APPENDIX A: MEASUREMENT INSTRUMENT DETAILS

APPENDIX B: TEST SAMPLE PHOTOGRAPHS

APPENDIX C: OPERATIONAL DESCRIPTIONS

APPENDIX D: TEST SAMPLE BLOCK DIAGRAM

APPENDIX E: TEST SAMPLE SCHEMATIC

APPENDIX F: TEST SAMPLE PCB LAYOUT

APPENDIX G: FCC ID LABELLING

APPENDIX H: GRAPHS of EMI MEASUREMENTS

APPENDIX I: CHANNEL BANDWIDTH PLOTS

APPENDIX J: PULSEWIDTH & DUTY CYCLE

APPENDIX K: USER MANUAL



This Laboratory is accredited by the National Association of Testing Authorities, Australia. The tests reported herein have been performed in accordance with its terms of accreditation for FCC Part 15. This document shall not be reproduced, except in full.